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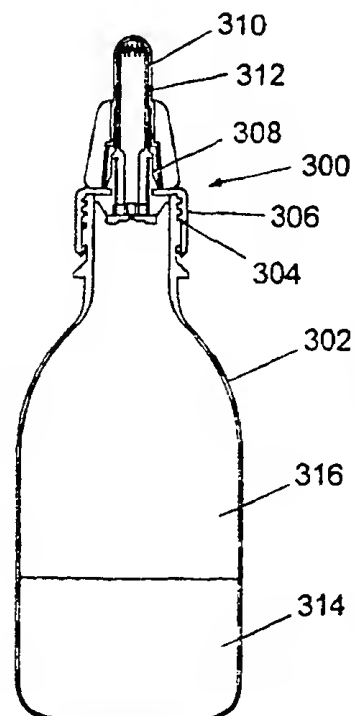
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(54) Title: METHOD OF PRODUCING A FROTHED LIQUID

(57) Abstract

A method of producing a frothed liquid, such as a milk shake or whipped cream is disclosed. The method involves the steps of filling a container (which may be of PET) to approximately one third capacity, then filling the remaining headspace with pressurised gas, for example at 120 psi, and sealing the container. Once the contents have reached equilibrium, the seal is breached to produce the frothed liquid. The method, and containers, disclosed have many significant advantages over known arrangements, in particular, there are significant cost savings associated with the method and containers of the present invention.



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1 METHOD OF PRODUCING A FROTHED LIQUID

2

3 This invention relates to a method of producing a
4 frothed liquid. Particularly but not exclusively it
5 relates to a method of producing a self-foaming
6 beverage for immediate consumption by a consumer, such
7 as a self-foaming refrigerated milk shake drink. It
8 also relates to a method of frothing more viscous
9 liquids to produce a whipped effect, for example to
10 produce whipped cream.

11

12 It is well known that mixing of liquid beverages with
13 various gases produces popular types of drink, such as
14 carbonated water, "fizzy" lemonade and even
15 self-foaming beers and lagers. Conventionally, in
16 production plants, these types of beverages are
17 produced by filling into individual containers such as
18 bottles or cans from a refrigerated saturation tower.
19 In these well known saturation towers the liquid flows
20 down through numerous platelets or glass balls in the
21 tower, which increase the surface area of the liquid,
22 while gas surrounds and is absorbed into the liquid.

23

24 When the beverage reaches the bottom of the saturation
25 tower it is dispensed by bottom filling into the

1 container leaving only a minimal "headspace" above the
2 beverage. "Headspace" is defined to be the liquid-free
3 space inside the container above the surface of liquid
4 in the container.

5

6 This method is in common use for the above-mentioned
7 drinks, and its use has been suggested for milk and
8 milk-based products, for example by the method
9 disclosed in Patent document WO 96/33618.

10

11 However introducing gas into milk or similar liquids by
12 such a method has the significant disadvantage that,
13 prior to capping of the product, when it is opened to
14 the atmosphere during the filling process the gas
15 expands and is released at such a rate as to cause
16 overflow of the beverage out of the container, due to
17 the absorption time required for a milk-type product to
18 be saturated with gas in a saturation tower being
19 undesirably long. For example, the absorption time
20 may be up to an hour at 9°C for nitrous oxide into
21 milk, compared to 2½ minutes for carbon dioxide into
22 water. Furthermore if the product fill is reduced to
23 say one third of the container capacity with two thirds
24 headspace to allow expansion of the product for
25 drinking from the container, for example using a straw,
26 then the problem arises that the saturated gas leaves
27 the product on storage to fill the headspace leaving
28 the beverage itself with insufficient gas to create a
29 self-foaming effect.

30

31 It would be desirable to have a method of producing a
32 self-foaming beverage without pre-dissolving the gas in
33 the liquid and which provided the consumer with a
34 palatable drink on breaching the beverage container.

35

36 According to a first aspect of the present invention

1 there is provided a method of producing a frothed
2 liquid comprising the steps of filling a container with
3 the liquid leaving a headspace above the liquid,
4 introducing pressurised gas into the headspace and
5 sealing the container.

6
7 The container is preferably then left for a period of
8 time during which the gas is absorbed into the liquid.
9 The period of time may be 24 hours during which the
10 contents of the container reach equilibrium at ambient
11 temperature, for example while the product is
12 transported to a retail outlet. Alternatively, or in
13 addition, the container may be shaken during or after
14 filling to increase the absorption rate of the gas into
15 the liquid. The liquid may also be cooled to reduce
16 absorption time. Once the container is shaken and the
17 seal is breached the beverage may foam up to
18 substantially fill the container and be ready to be
19 consumed, for example through a drinking straw or by
20 pouring the beverage directly into a glass.
21 Alternatively the frothed liquid may be released via a
22 valve mechanism provided on the container.

23
24 Preferably the liquid used in the method is one having
25 a high viscosity, for example a viscosity higher than
26 that of water such as the viscosity of cream at ambient
27 temperature. This helps trap expanding gas bubbles
28 after the container is breached, thereby prolonging the
29 stability of the foamed beverage. The liquid may, for
30 example, have a high fat content. Most preferred
31 examples of liquids are milk, yoghurts, creams and any
32 of the foregoing containing alcohol, such as milk-based
33 liqueurs. Examples would be GODET (RTM) or BAILEYS
34 (RTM) liqueur.

35
36 Preferably the container is a plastic bottle. The

1 plastic may be polyethylene terephthalate (PET). This
2 has the advantage of being much cheaper than an aerosol
3 can, for example. The plastic bottle may be fitted
4 with a conventional lid modified by the inclusion of a
5 valve. The valve may be a standard aerosol valve. It
6 may be a tilt valve. In another example, the container
7 may be of glass.

8
9 In the example where the liquid is cream, the method of
10 the present invention produces cream having a whipped
11 texture and appearance.

12
13 Preferably the container is for a single use only. For
14 example, when a customer purchases the container with
15 cream or liquid therein, they use it only once to
16 produce whipped cream or frothed liquid, and do not
17 store the container, part full, for any future use.

18
19 This overcomes the problem of the cream (or other
20 liquid) becoming frothed inside the bottle, as can
21 happen when a relatively small amount of cream (or
22 liquid) is left in the container between uses.
23 Alternatively, the container may be provided with
24 design features for urging any liquid (which may be
25 frothed) toward the container opening to allow for
26 further use of the container.

27
28 In another example, the container may be a tub. The
29 tub may have liqueur and/or cream therein, so that when
30 breached, a blancmange-type dessert is produced.

31
32 Preferably the container and its contents are stored at
33 a temperature below room temperature.

34
35 Preferably the gas is nitrous oxide.

36

1 Preferably the headspace is between 10% and 90% of the
2 total volume of the container. For example the
3 headspace may be between 50% and 80%.

4

5 Preferably the gas is pressurised between 20psi and
6 150psi. For example, the gas in the headspace may
7 initially be at a pressure of 120psi (for cream in a
8 PET bottle with a tilt valve fitted).

9

10 In a preferred embodiment the headspace is
11 approximately 67%, being two thirds of the volume of
12 the container. In the preferred embodiment the liquid
13 takes up about one third of the container. Typically
14 the gas is introduced under pressure of approximately
15 60psi (4bar).

16

17 Preferably the container is purged with the gas prior
18 to filling with the liquid. The gas is typically
19 pressure filled into the headspace. Alternatively it
20 may be volume filled.

21

22 Preferably, the gas is filled into the headspace in the
23 container via a one-way valve in the container. For
24 example, where the container is a bottle, the one-way
25 valve may be provided in the lid of the bottle. The
26 one-way valve may be a rubber plug in the container.
27 In the case of a rubber plug, the gas may be filled by
28 insertion of a needle through the plug. On removal of
29 the needle, the container is sealed. Alternatively the
30 valve may be a single hole to the exterior of the
31 container and one or more holes to the interior which
32 are offset from the exterior hole. The interior holes
33 may be on a platform spaced from the exterior hole, for
34 example by a rubber stopper. In this case, the gas is
35 filled through the exterior hole and reaches the inside
36 of the container via the interior holes. The pressure

1 of the gas inside the container then pushes the
2 platform into contact with the container, forming a
3 seal. As a further alternative, a standard rubber
4 mushroom valve may be used.

5
6 Preferably the container is provided with a device for
7 injecting a beverage-enhancing liquid into the
8 container upon breach of the seal. The beverage-
9 enhancing liquid may be coloured or flavoured.
10 Typically when the seal is breached, the beverage-
11 enhancing liquid is fired out of said device, hits the
12 surface of the main liquid from and then mixes into the
13 liquid during the foaming process. For example, a
14 modified version of the device disclosed in Patent
15 document WO 97/21605 may be used.

16
17 Preferably the container is provided with a drinking
18 straw device which rises up in the container when the
19 seal is breached forcing the straw into a position for
20 drinking.

21
22 According to a second aspect of the present invention
23 there is provided a beverage package comprising a
24 container means having a closable top opening, cap
25 means for capping the top opening of the container
26 means to close and seal the container means in a
27 substantially leak-proof manner, the cap means being
28 selectively detachable from the top opening of the
29 container means to unseal and open the container means,
30 a quantity of foamable beverage initially within the
31 container means, foaming means for foaming at least
32 part of the quantity of beverage upon uncapping and
33 opening of the container means, a drinking straw means
34 disposed initially entirely within the container means,
35 and interaction means attached to or forming part of
36 the drinking straw means for interacting with the

1 foaming beverage upon uncapping and opening of the
2 container means to raise part of the drinking straw
3 means through the now-open top of the container means.

4
5 The interaction means may comprise baffle means
6 extending radially outwards from the drinking straw
7 means to interact with the flow of rising foaming
8 beverage upon the opening of the container means
9 whereby to apply a lifting force to the drinking straw
10 means. The baffle means may comprise turbulence-
11 promoting means for promoting turbulence in the
12 beverage and/or in the foam upon opening of the
13 container. The interaction means preferably has the
14 form of an impeller fan disc clipped around the
15 drinking straw means part-way up the height thereof.
16 The interaction means (of whatever form) is preferably
17 formed and dimensioned, and preferably has a location
18 in the drinking straw means, such as to prevent or
19 impede the drinking straw means rising completely
20 through the open top of the container means.

21
22 According to a third aspect of the present invention
23 there is provided a beverage package comprising a
24 container means having a closable top opening, cap
25 means for capping the top opening of the container
26 means to close and seal the container means in a
27 substantially leak-proof manner, the cap means being
28 selectively detachable from the top opening of the
29 container means to unseal and open the container means,
30 a quantity of foamable beverage initially within the
31 container means, foaming means for foaming at least
32 part of the quantity of beverage upon uncapping and
33 opening of the container means, a drinking straw means
34 disposed initially entirely within the container means,
35 and turbulence inducing means disposed within the
36 container means for inducing turbulence in the foaming

1 beverage upon uncapping and opening of the container
2 means.

3
4 The turbulence inducing means is preferably tethered
5 within the container means or attached to a fixed point
6 within the container means. The turbulence inducing
7 means may take the form of baffle means to interact
8 with the flow of rising foaming beverage upon the
9 opening of the container means in a manner to induce
10 turbulence in the foaming beverage, and preferably in a
11 manner which enhances mixing of beverage components.

12
13 The foaming means in the second and third aspects of
14 the invention may comprise a quantity of gas dissolved
15 in the beverage in a concentration sufficient that
16 depressurisation of the interior of the container means
17 upon uncapping thereof induces gas to come out of
18 solution to generate foam. Alternatively, or
19 additionally, the foaming means may comprise an
20 auxiliary container means initially containing
21 pressurised gas releasable from the auxiliary container
22 means into the beverage upon uncapping of the container
23 means. The gas comprised in the foaming means may be
24 an individual gas or a mixture of gases selected from
25 the group of gases including (but not restricted to)
26 carbon dioxide, nitrogen, and nitrous oxide.

27
28 In the second and third aspects of the invention, the
29 beverage comprised in the beverage package may be an
30 comestible liquid or mixture of liquids, but is
31 preferably a milk-based beverage. Such a milk-based
32 beverage may be whole milk or semi-skimmed milk or
33 skimmed milk, with or without minor additives such as
34 flavourings, sweeteners, and colourings; however, it is
35 preferred that the milk-based beverage contains a
36 substantial proportion of ethanol (ethyl alcohol), for

1 example in the form of an alcoholic wine or an
2 alcoholic liqueur. The milk-based beverage is
3 preferably a naturally thick beverage, for example a
4 yoghurt, but thickeners may optionally be added to
5 achieve a requisite viscosity in the beverage.
6

7 According to a fourth aspect of the present invention
8 there is provided a beverage package comprising a
9 container means having a closable top opening, cap
10 means for capping the top opening of the container
11 means to close and seal the container means in a
12 substantially leak-proof manner, the cap means being
13 selectively detachable from the top opening of the
14 container means to unseal and open the container means,
15 a quantity of foamable beverage initially within the
16 container means, foaming means for foaming at least
17 part of the quantity of beverage upon uncapping and
18 opening of the container means.
19

20 Specific embodiments of the invention will now be
21 described by way of example only with reference to the
22 accompanying drawings in which:
23

24 Fig 1 is a side view in cross-section of a
25 container used in the method of the present
26 invention shown filled with liquid and sealed;
27

28 Fig 2 is a view from above of a cap containing a
29 one-way valve which may be used to fill the
30 container of Fig 1;
31

32 Fig 3 is a view from below of the cap of Fig 2;
33

34 Fig 4 is a side view in cross-section of the
35 container of Fig 1 showing the beverage ready for
36 consumption;

1 Fig 5 is a side view in cross-section of the cap
2 of Fig 2;

3
4 Fig 6 is a diametral sectional elevation of a
5 sealed bottle containing a foamable milk-based
6 beverage, and a drinking straw having an impeller
7 fan disc attached thereto;

8
9 Fig 7 is a plan view of the impeller fan disc of
10 Fig 6 as a separate component;

11
12 Fig 8 shows the bottle of Fig 6 as newly uncapped,
13 and with the beverage commencing to foam and rise;

14
15 Fig 9 shows the next stage in foaming of the
16 beverage, and with the drinking straw beginning to
17 rise out of the bottle;

18
19 Fig 10 shows completion of the foaming, and with
20 the drinking straw at its maximum reach out of the
21 bottle;

22
23 Fig 11 shows an optional repositioning of the
24 drinking straw within the bottle;

25
26 Fig 12 is a side view in cross-section of a
27 modified PET bottle for use in the method of the
28 present invention; and

29
30 Fig 13 is a side view in cross-section of a
31 modified PET aerosol bottle with valve for use in
32 the method of the present invention.

33
34 Referring to the accompanying drawings, Fig 1 shows a
35 container 10, in this case a standard bottle 12 having
36 a capacity of approximately 500ml and manufactured from

1 polyethylene terephthalate (PET) or other plastics
2 material. The bottle 12 has a 32mm diameter neck and
3 is provided with a threaded polypropylene cap 16.
4
5 The cap 16 incorporates a one-way valve which in the
6 example of Fig 1 is in the form of a rubber plug 26.
7 However in other embodiments a different type of valve
8 may be used. For example, a cap 116 incorporating an
9 alternative one-way valve is shown in Figs 2, 3 and 5.
10 This valve includes a hole 118 on the exterior (or top
11 surface) of the cap 116 through which gas may be filled
12 into the container. Also shown in Fig 2 is an optional
13 decorative foil cover 120 which can be placed over the
14 hole 118 to disguise it from the end consumer. On the
15 underside of the cap 116 is a moveable platform 122
16 which is supported by a ring seal 126. This
17 arrangement is most clearly seen in Fig 5. The
18 platform 122 is provided with a number of interior
19 holes 124 and is made of a resilient material so that
20 it is moveable between open and closed positions. In
21 Fig 5 the platform 122 is shown in the open position.
22 As gas is filled through hole 118 the gas pressure
23 keeps the valve open and the gas passes into the
24 container via holes 124 in the direction shown by the
25 arrows in Fig 5. Once filling stops, the pressure of
26 the gas within the container forces the platform 122
27 into contact with the top of the cap 116, ie the closed
28 position, thereby forming a seal and preventing escape
29 of the gas. As further alternatives to the foregoing,
30 known one-way valves can be employed.
31
32 Turning back now to Fig 1, in this example, prior to
33 fitting the cap 16 to the bottle 12 the bottle 12 is
34 purged with gas, in this case nitrous oxide, to remove
35 contaminating air. It is then filled with liquid 18 to
36 about one third capacity. The liquid 18 in this

1 example is a milk-based liqueur but could be another
2 liquid. Approximately 170ml of liquid is used in this
3 example. Therefore a headspace 28 of approximately two
4 thirds of the volume of the container 10 remains.
5 Other proportions are possible in other embodiments of
6 the invention.

7
8 In this embodiment, following liquid fill, a drinking
9 straw 20 is inserted into the bottle, as can be seen in
10 Fig 1. The straw 20 is fitted with a flotation device
11 24 the operation of which will be briefly explained
12 below. The cap 16 is then fitted to the main body of
13 the bottle 12. A gas filling head (not shown) then
14 engages with the one-way valve 26 in the cap 16 and the
15 container 10 is pressurised to 60 psi gauge through the
16 one-way valve 26. As far as Fig 1 is concerned, a
17 hypodermic needle (not shown) may be inserted through
18 the rubber plug 26 for gas filling. Alternatively,
19 when using the valve of Figs 2 and 3 the filling head
20 engages in hole 118 for filling.

21
22 It is possible to shake the container 10 and contents
23 during filling to increase the absorption rate of the
24 gas into the liquid 18. However, more simply, once the
25 headspace 28 is filled and the container sealed (via
26 the one-way valve) the container can simply be boxed
27 and stored in the usual way and within approximately 24
28 hours the gas has saturated the liquid and reached
29 equilibrium, the pressure in the bottle being reduced
30 to about 55 psi. If the product in this example was
31 refrigerated to 5°C the pressure would reduce to about
32 45psi at equilibrium. This is because of the
33 substantial initial headspace and the ratio of that
34 headspace to the liquid.

35
36 The product has the advantage that it need not be

1 chilled. Filling can be achieved at ambient
2 temperatures. However, it should be noted that
3 chilling does increase absorption rate.

4
5 After filling with the gas is complete, an aluminium
6 foil sealing disc 120 is heat sealed over the one-way
7 valve on top of the cap 116.

8
9 When the end consumer is ready to drink the beverage,
10 they simply refrigerate the container and its contents
11 to approximately 5°C, twist the cap 16 and remove it.
12 Chilling increases the viscosity of the liquid thereby
13 prolonging the foaming effect. (Optionally the
14 container 10 can be shaken prior to opening.) Once the
15 cap 16 is removed the gas-saturated liquid is
16 depressurised and the gas (nitrous oxide) begins to
17 expand and come out of solution in the form of bubbles.
18 In the example shown in Figs 1 and 4 the liquid 18 and
19 bubbles rise upwards to completely fill the bottle (as
20 can be seen from Fig 4), subject to the bottle having
21 been shaken prior to opening. As the mixture rises,
22 the device 24 is pushed upwards thereby freeing the top
23 end of the straw 20 for use by the consumer. In
24 another possible embodiment, the beverage is simply
25 poured into a glass, jug or the like for immediate
26 consumption without any need for shaking. In the
27 example described the beverage produced by the method
28 of the invention is a thick, frothy, liqueur milk
29 shake. The milk shake may stay frothy for up to half
30 an hour or more before consumption, but is best used as
31 soon after broaching as possible.

32
33 In the case where the container is not provided with a
34 straw, and the beverage is to be poured into a glass
35 for drinking, the container may be fitted with a device
36 which injects flavour and/or colour into the container

1 when the seal is breached. The flavour and/or colour
2 then filtrates through the beverage as it is poured
3 out, enhancing the taste and/or appearance of the
4 beverage in the glass. For example, a "raspberry
5 ripple" effect may be obtained.

6
7 The method described has the advantage that milk-based
8 products can now be mixed with gases in a controllable
9 and efficient manner, producing a far superior beverage
10 than is possible with known methods.

11
12 Referring now to Fig 6, a complete and self-contained
13 beverage package 210 comprises a bottle 212 of any
14 suitable material, for example a glass or a food-grade
15 plastics material, eg PET (polyethylene terephthalate),
16 which is preferably opaque to visible light such as to
17 render invisible the contents of the bottle 212 in
18 general and the internal level of liquid in particular.
19 The bottle 212 is formed with an externally threaded
20 neck 214 shaped and dimensioned to be a cooperative fit
21 with a screw cap 216 by which the bottle 212 is
22 initially closed and sealed.

23
24 Before being capped and sealed, the bottle 212 is pre-
25 filled with a predetermined quantity of beverage 218,
26 this quantity being selected to be substantially less
27 than the total internal volume of the bottle 212 for
28 reasons which will be explained subsequently. The
29 beverage 218 is a mixture of yoghurt and an alcoholic
30 liqueur. The beverage 218 is also saturated with
31 dissolved nitrous oxide such that prior to opening of
32 the bottle 212, the internal pressure of the bottle 212
33 is substantially greater than ambient atmospheric
34 pressure.

35
36 The bottle 218 is also pre-packed with a drinking straw

1 220 of the known type having a corrugated portion 222
2 which allows the straw 220 to be folded double without
3 transversely collapsing. The full length of the straw
4 220 is considerably greater than the height of the
5 bottle 212 (see Fig 11), but the corrugated portion 222
6 allows the straw 220 to be sufficiently shortened by
7 folding as to fit entirely within the bottle 212 (see
8 Fig 6).

9
10 Referring to Fig 7, this shows an impeller fan disc 224
11 which is of moulded plastics or stamped from sheet
12 plastics to have eight equi-spaced blades 226 radially
13 extending from a central hub 228. Each of the blades
14 226 is twisted with respect to the principal plane of
15 the impeller fan disc 224 in an angular direction which
16 may conveniently be termed "clockwise rising", ie if
17 the disc 224 were rotating clockwise as viewed in Fig
18 7, the leading edge of each blade 226 would be above
19 the plane of Fig 7 while the trailing edge of each
20 blade 226 would be below the plane of Fig 7. The
21 overall diameter of the disc 224 is significantly
22 greater than the internal diameter of the bottle neck
23 214, for a reason which will be explained subsequently.
24 The hub 228 has a central perforation 230 dimensioned
25 to allow the impeller fan disc 224 to be force-fitted
26 onto and thereby secured to the exterior of the
27 drinking straw 220 at a position somewhat above the
28 surface of the quiescent beverage 218 in the capped and
29 sealed bottle 212, as shown in Fig 6.

30
31 The sealed beverage package 210 can be manufactured in
32 bulk in a conventional beverage bottling and labelling
33 plant (not shown), modified (if not already suitable)
34 for the insertion of a drinking straw into each bottle,
35 each inserted straw having an impeller fan disc
36 previously attached thereto. If necessary or

1 desirable, the newly filled and sealed packages 210 can
2 be subjected to beverage preserving treatment, eg
3 sustained refrigeration at a temperature suitable for
4 maintaining the beverage non-toxic and potable for at
5 least a predetermined period (ie until a nominal "use
6 by" or "best before" date printed on the package 210
7 contemporaneously with loading and capping of the
8 bottle 212).

9
10 Referring next to Fig 8, this shows the initial stage
11 of opening of the bottle 212 for the purpose of
12 consuming the beverage 218 contained in the bottle 212.
13 Firstly, the cap 216 is unscrewed from the bottle neck
14 214 and discarded. Removal of the cap 216 breaks the
15 seal on the bottle 212 and opens the top of the bottle
16 212. The ullage of the bottle 212 (the liquid-free
17 space inside the bottle 212 above the surface of the
18 liquid beverage 218) was previously at a pressure
19 substantially above ambient atmospheric pressure, and
20 the ullage pressure drops substantially to ambient
21 atmospheric pressure as soon as the cap 216 is
22 unscrewed and removed from the top of the bottle 212.
23 Consequently, the gas-saturated liquid beverage 218 is
24 depressurised, and the previously dissolved nitrous
25 oxide starts coming out of solution in the beverage in
26 the form of numerous bubbles. This leads to foaming of
27 the beverage 218, with concomitant volumetric
28 expansion, and the start of such foaming and expansion
29 is depicted in Fig 8.

30
31 The following stage is depicted in Fig 9, wherein the
32 expanding foam has just submerged the disc 224. The
33 surging foam interacts with the disc 224 in a manner
34 imparting uplift to the disc 224. Since the disc 224
35 is secured to the drinking straw 220, the interaction
36 of the foaming beverage 218 with the disc 224 tends to

1 uplift the straw 220. Fig 9 shows the early stages of
2 elevation of the straw 220 by the burgeoning foam.

3

4 Fig 10 depicts the foamed beverage at about its maximum
5 volumetric expansion. The ingredients of the beverage
6 218 and the extent of its gasification are selected
7 such that the fully expanded foam nearly fills the
8 bottle 212, preferably without significant likelihood
9 of overflowing the bottle neck 214 in typical ambient
10 temperatures. The expanding foam will have lifted the
11 straw 220 out of the bottle 212 to the maximum extent
12 possible, which is deliberately limited to about what
13 is depicted in Fig 10 by reason of the overall diameter
14 of the disc 224 being selected to be substantially
15 greater than the internal diameter of the bottle neck
16 214 such that the disc 224 jams below the neck 214 as
17 depicted in Fig 10 whereby the straw 220 cannot
18 completely separate from the bottle 212.

19 Notwithstanding this limitation, the upper end of the
20 straw 220 is now readily available to be contacted by
21 the intended consumer of the foamed beverage, eg the
22 free (upper) end of the straw above the bottle 212 can
23 be manually grasped by the consumer, and the foamed
24 beverage sucked through the straw 220. If the consumer
25 desires, the inlet (lower) end of the straw 220 inside
26 the bottle 212 can be lowered to the bottom of the
27 bottle 212 as shown in Fig 11 for the consumption of
28 denser beverage foam (beverage having a greater ratio
29 of liquid volume to bubble volume) or substantially
30 unfoamed liquid beverage, according to circumstances.

31

32 It will be appreciated that Figs 8 to 10 are
33 "snapshots" in a continuous process rather than
34 discrete steps between unsealing of the package 210 and
35 commencement of beverage consumption following foaming
36 and straw elevation.

1 Turning now to Fig 12, a container 300 is shown which
2 is for use in producing whipped cream.

3
4 The container 300 is shown in the form in which it
5 would be offered to an end user. The container 300
6 consists of a small PET bottle 302 have a screw thread
7 304 at its neck for engagement with a threaded cap 306.
8 The cap 306 has been modified by the inclusion of a
9 conventional aerosol valve 308. The valve 308 is
10 fitted with a serrated nozzle 310, and a protective end
11 cap 312 seals the assembly.

12
13 The container 300 is filled in much the same way as
14 previously described with reference to the other
15 drawings. However, in this embodiment the liquid used
16 is cream 314, preferably fresh cream. The cream 314 is
17 filled to approximately one third of the volume of the
18 bottle 302, prior to fitting the cap and valve
19 assembly. The headspace 316 is then filled with
20 nitrous oxide (in this example) to a pressure of 120
21 psi. This can be achieved using standard aerosol
22 filling tools. The nozzle 310 and end cap 312 (and
23 labels if desired) are then fitted to complete the
24 product. After a short period in storage, the contents
25 of the bottle reach equilibrium at approximately 60
26 psi. The product is then ready for use. In this
27 example to dispense whipped cream, and end user simply
28 removes the end cap 312, shakes the bottle, directs the
29 nozzle end downwards and presses against the side of
30 the nozzle 310. This action opens the valve 308 and
31 the pressurised cream is released through the valve 308
32 and nozzle 310. The gas dissolved in the cream gives a
33 "whipped" effect and the serrated nozzle 310 produces
34 an attractive pattern on the cream as it is dispensed.
35 The product described in this example is designed to be
36 for a single use, in the sense that it should not be

1 used in part, then restored, then used again. The
2 purpose is to produce a limited amount of fresh whipped
3 cream, after which the container is disposed.

4

5 The product should also be chilled prior to use.
6 Temperature affects the absorption of the gas into the
7 cream. In addition, the cream should be chilled to
8 keep it fresh for a longer period of time.

9

10 Fig 13 shows a similar arrangement to that of Fig 12.
11 However, in Fig 13 a PET aerosol container 402 is used
12 to hold the cream 314. The PET aerosol 402 has a
13 standard 1" (2.54cm) opening in at its neck, to which a
14 valve assembly 408 is fitted using known methods. The
15 valve assembly includes a valve 308 and nozzle 310 as
16 previously described. A modified end cap 412 is also
17 provided.

18

19 The container of Fig 13 is filled and used in much the
20 same way as already described with reference to Fig 12.

21

22 The embodiments described have many significant
23 advantages over known arrangements, such known
24 arrangements including aerosol cans for dispensing
25 frothed longlife milk products. For example, the PET
26 bottles used in the manufacture of the container of the
27 present invention are much cheaper than metal aerosol
28 cans. In addition, a small amount of fresh cream can
29 be used to produce a significant amount of whipped
30 cream. The shelf life of the product is prolonged by
31 the use of nitrous oxide as it has preserving
32 properties. Furthermore, the product is in effect
33 "disposable" being for a single use only. Yet another
34 advantage over know aerosol arrangements is that,
35 because of the important ratio of liquid to headspace,
36 gas can be introduced at a much lower pressure than

1 otherwise possible (for example only 120 psi). The
2 desired effect is still achieved. PET or other
3 materials such as glass, can withstand these lower
4 pressures, and there is no longer a need for stronger
5 and far more costly metal cans.

6
7 Milk-based beverages other than those detailed above
8 can be substituted without departing from the scope of
9 the invention.

10
11 Modifications and improvements may be made to the
12 foregoing without departing from the intended scope of
13 invention. In particular, depending on the liquid
14 involved and the desired properties of the beverage,
15 different liquids and gases can be used, in different
16 ratios of headspace to liquid and different gas
17 pressures may be used. For example, to make a more
18 dense beverage less headspace and higher pressure gas
19 may be used. Furthermore, the invention extends to a
20 beverage or frothed liquid produced in accordance with
21 the method described, to the container used in the
22 method, and to the special one-way valve described.
23

1 CLAIMS

2

3 1. A method of producing a frothed liquid comprising
4 the steps of filling a container with the liquid
5 leaving a headspace above the liquid, introducing
6 pressurised gas into the headspace and sealing the
7 container.

8

9 2. A method as claimed in Claim 1 wherein the liquid
10 is cream.

11

12 3. A method as claimed in Claim 1 or 2 wherein the
13 container is of plastics material.

14

15 4. A method as claimed in any preceding Claim
16 wherein the container is a PET bottle.

17

18 5. A method as claimed in any preceding Claim wherein
19 the headspace is between 50% and 80% of the total
20 volume of the container.

21

22 6. A method as claimed in any preceding Claim wherein
23 the gas is pressurised between 20 psi and 150 psi.

24

25 7. A method as claimed in any preceding Claim wherein
26 the container is stored at below room temperature
27 prior to breaking the seal.

28

29 8. A container for use in the method of any one of
30 Claims 1 to 7.

31

32 9. A container as claimed in Claim 8 which is for a
33 single use only.

34

35 10. A beverage package comprising a container means
36 having a closable top opening, cap means for

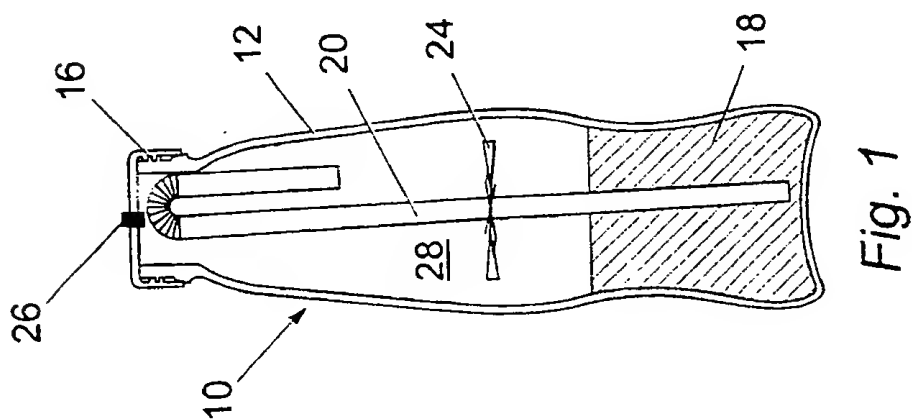
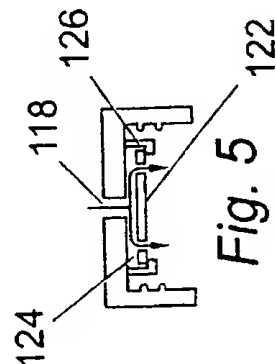
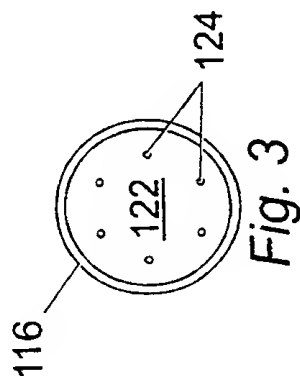
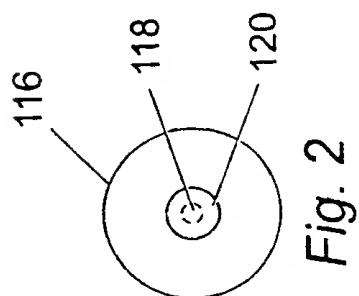
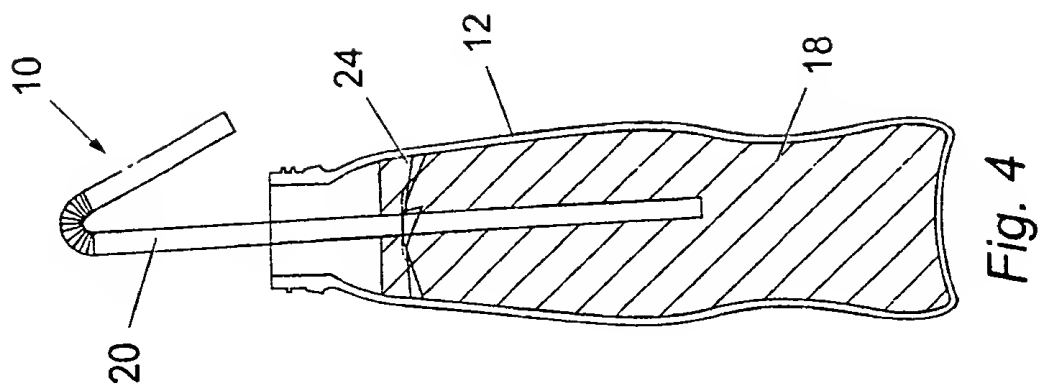
1 capping the top opening of the container means to
2 close and seal the container means in a
3 substantially leak-proof manner, the cap means
4 being selectively detachable from the top opening
5 of the container means to unseal and open the
6 container means, a quantity of foamable beverage
7 initially within the container means, foaming
8 means for foaming at least part of the quantity of
9 beverage upon uncapping and opening of the
10 container means, a drinking straw means disposed
11 initially entirely within the container means, and
12 interaction means attached to or forming part of
13 the drinking straw means for interacting with the
14 foaming beverage upon uncapping and opening of the
15 container means to raise part of the drinking
16 straw means through the now-open top of the
17 container means.

18

19 11. A beverage package comprising a container means
20 having a closable top opening, cap means for
21 capping the top opening of the container means to
22 close and seal the container means in a
23 substantially leak-proof manner, the cap means
24 being selectively detachable from the top opening
25 of the container means to unseal and open the
26 container means, a quantity of foamable beverage
27 initially within the container means, foaming
28 means for foaming at least part of the quantity of
29 beverage upon uncapping and opening of the
30 container means, a drinking straw means disposed
31 initially entirely within the container means, and
32 turbulence inducing means disposed within the
33 container means for inducing turbulence in the
34 foaming beverage upon uncapping and opening of the
35 container means.

36

- 1 12. A beverage package comprising a container means
2 having a closable top opening, cap means for
3 capping the top opening of the container means to
4 close and seal the container means in a
5 substantially leak-proof manner, the cap means
6 being selectively detachable from the top opening
7 of the container means to unseal and open the
8 container means, a quantity of foamable beverage
9 initially within the container means, foaming
10 means for foaming at least part of the quantity of
11 beverage upon uncapping and opening of the
12 container means.
13
- 14 13. A method substantially as hereinbefore described
15 with reference to the accompanying drawings.
16
- 17 14. A container or package substantially as
18 hereinbefore described with reference to the
19 accompanying drawings.
20



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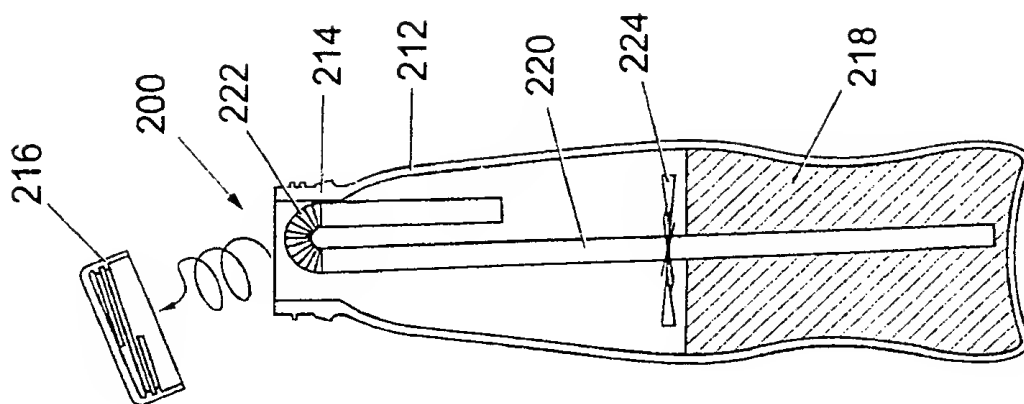


Fig. 8

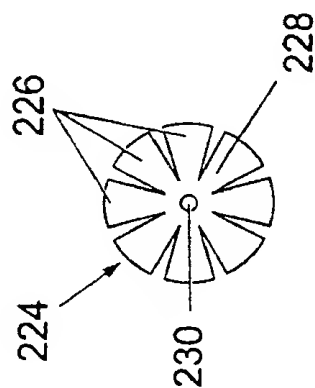


Fig. 7

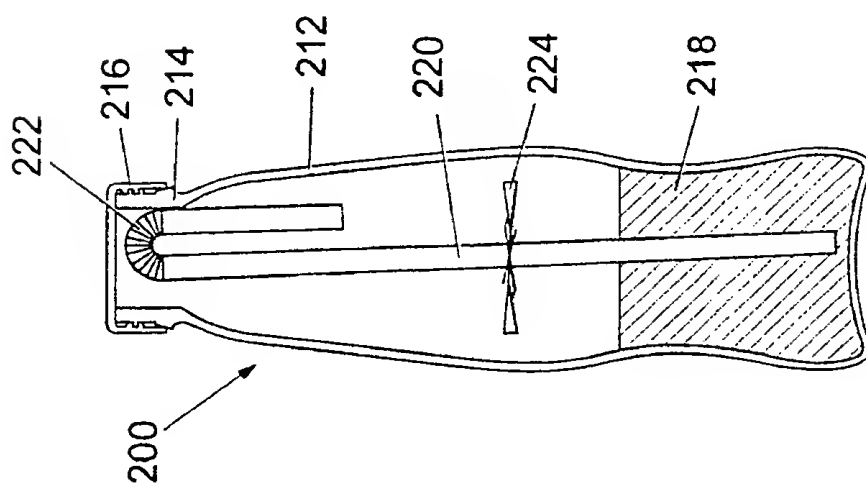


Fig. 6

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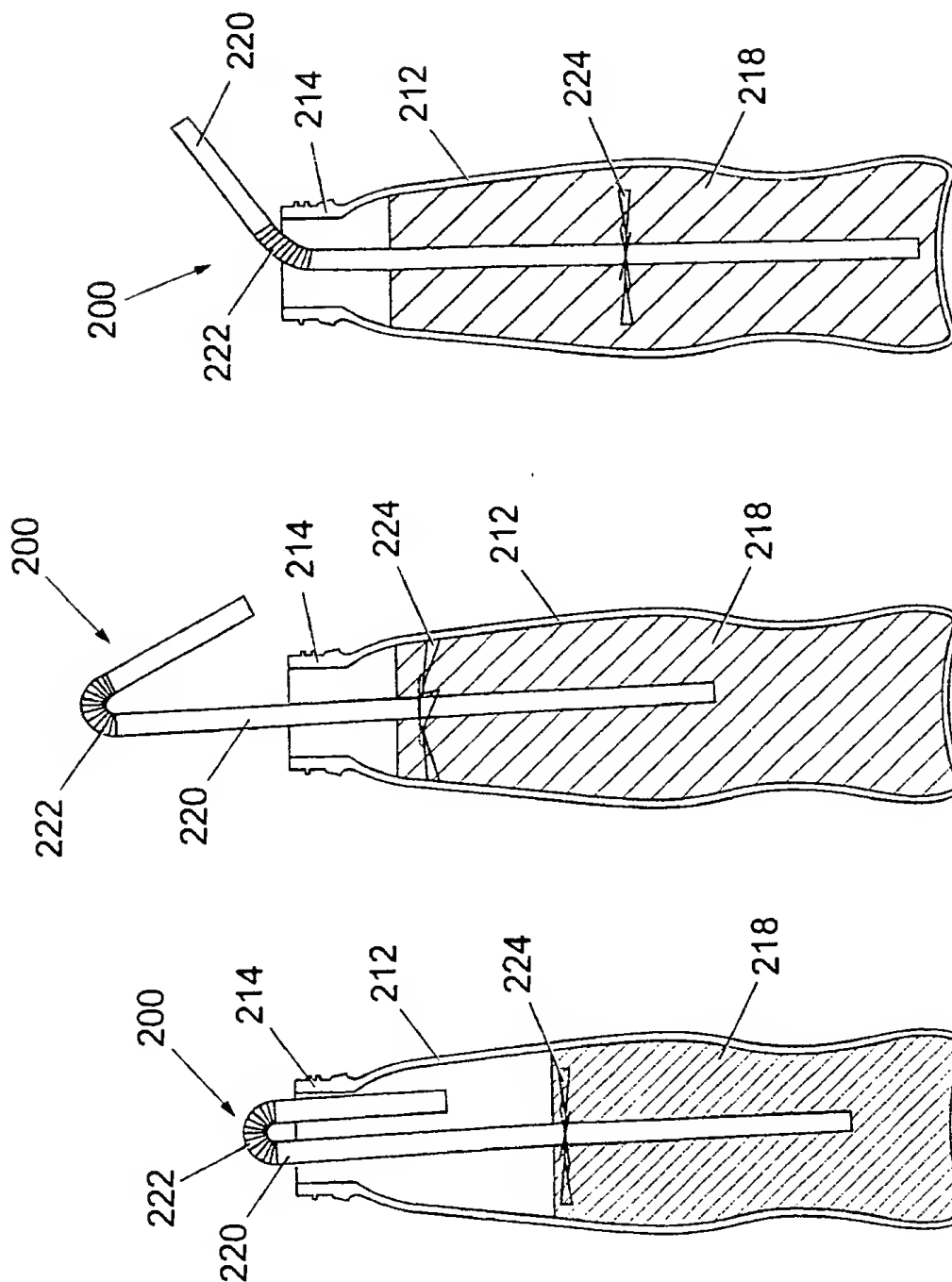


Fig. 11

Fig. 10

Fig. 9

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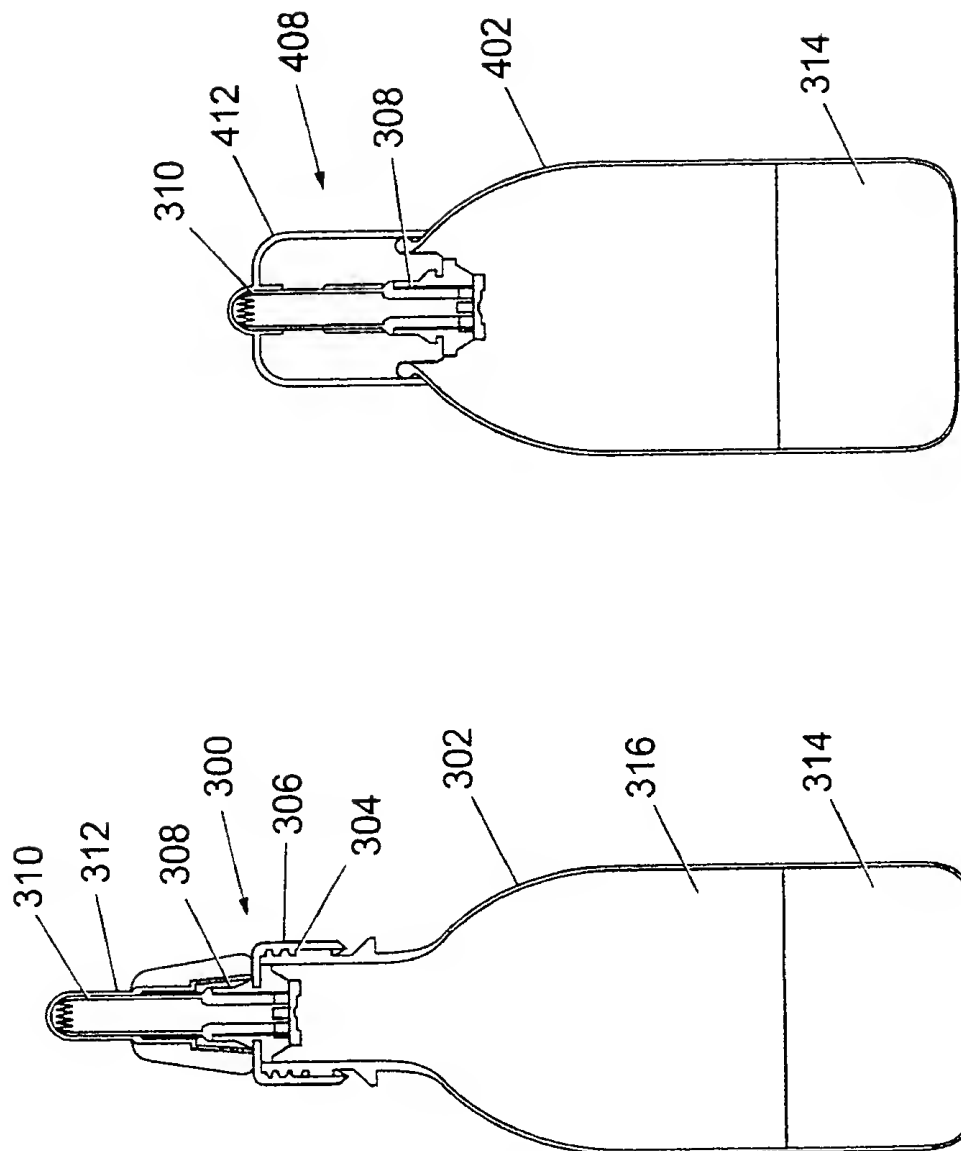


Fig. 13

Fig. 12

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 98/00533

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 A47J43/12 B65D79/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A47J B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	US 3 868 978 A (KNOPF KARL HORST) 4 March 1975 see column 1, line 54 - column 2, line 35; figures	1-9
Y	EP 0 078 789 A (FOLIENWALZWERK BUEDER TEICH A.G.) 11 May 1983 see column 3, line 15 - column 7, line 17; figures	10-14
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☒ Patent family members are listed in annex

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Date of the actual completion of the international search

24 June 1998

Date of making of the international search report

03/07/1998

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Olsson, B

INTERNATIONAL SEARCH REPORT

Int. Application No.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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